

WHAT IS CLAIMED IS:

1. An electromotive device used in an oil, said electromagnetic device comprising:

an outer casing;

a moveable shaft supported by said outer casing;

a bobbin disposed inside said outer casing so as to be disposed around said moveable shaft on a common axis with said moveable shaft; and

a coil embedded in an outer molding, said coil being constructed by winding onto said bobbin a conducting wire in which an electrically-insulating layer is coated onto a copper wire,

wherein said electrically-insulating layer is removed from an end portion of said conducting wire and said end portion of said conducting wire is wound onto a tie-off portion of a coil terminal mounted to said bobbin to constitute a wound-on portion,

a solder-retaining member is mounted so as to cover said wound-on portion of said conducting wire on said tie-off portion,

said wound-on portion of said conducting wire is soldered to said tie-off portion together with said solder-retaining member, and

said solder-retaining member is a cylindrical shape disposed so as to surround said wound-on portion of said conducting wire.

2. The electromagnetic device according to Claim 1, wherein said solder-retaining member is composed of a solder-plated steel plate.

3. An electromotive device used in an oil, said electromagnetic device comprising:

an outer casing;

a moveable shaft supported by said outer casing;

a bobbin disposed inside said outer casing so as to be disposed around said moveable shaft on a common axis with said moveable shaft; and

a coil embedded in an outer molding, said coil being constructed by winding onto said bobbin a conducting wire in which an electrically-insulating layer is coated onto a copper wire,

wherein said electrically-insulating layer is removed from an end portion of said conducting wire and said end portion of said conducting wire is wound onto a tie-off portion of a coil terminal mounted to said bobbin to constitute a wound-on portion,

a solder-retaining member is mounted so as to cover said wound-on portion of said conducting wire on said tie-off portion,

said wound-on portion of said conducting wire is soldered to said tie-off portion together with said solder-retaining member, and

said solder-retaining member is a conductor wire wound so as to overlap said wound-on portion of said conducting wire.

4. The electromagnetic device according to Claim 3, wherein said conductor wire is a solder-plated copper wire.

5. The electromotive device according to Claim 4, wherein said bobbin is constituted by first and second bobbins arranged in an axial direction of said moveable shaft, and

said coil is constituted by first phase and second phase excitation coils formed by winding two strands of said conducting wire into unifilar windings on a conducting-wire spool portion of said first bobbin, and third phase and fourth phase excitation coils formed by winding two strands of said conducting wire into unifilar windings on a conducting-wire spool portion of said second bobbin.

6. The electromagnetic device according to Claim 5, wherein:

said first phase excitation coil is constructed by winding one strand of said conducting wire for a predetermined number of winds onto a bottom-surface side of said conducting-wire spool portion of said first bobbin;

said second phase excitation coil is constructed by winding the other strand of said conducting wire for a predetermined number of winds onto said conducting-wire spool portion of said first bobbin so as to overlap said first phase excitation coil;

said third phase excitation coil is constructed by winding one strand of said conducting wire for a predetermined number of winds onto a bottom-surface side of said conducting-wire spool portion of said second bobbin; and

said fourth phase excitation coil is constructed by winding the other strand of

said conducting wire for a predetermined number of winds onto said conducting-wire spool portion of said second bobbin so as to overlap said third phase excitation coil.

7. The electromagnetic device according to Claim 5, wherein:

said conducting-wire spool portions of said first and second bobbins are each divided into two divided spool portions in an axial direction of said moveable shaft; and

said first phase to fourth phase excitation coils are constructed by winding one strand of said conducting wire onto each of said divided spool portions of said conducting-wire spool portions of said first and second bobbins.

8. An electromagnetic device used in an oil, said electromagnetic device comprising:

an outer casing;

a moveable shaft supported by said outer casing;

a bobbin disposed inside said outer casing so as to be disposed around said moveable shaft on a common axis with said moveable shaft; and

a coil embedded in an outer molding, said coil being constructed by winding onto said bobbin a conducting wire in which an electrically-insulating layer is coated onto a copper wire,

wherein said electrically-insulating layer is removed from an end portion of said conducting wire and said end portion of said conducting wire is wound onto a tie-off portion of a coil terminal mounted to said bobbin to constitute a wound-on portion,

a solder-retaining member is mounted so as to cover said wound-on portion of said conducting wire on said tie-off portion,

said wound-on portion of said conducting wire is soldered to said tie-off portion together with said solder-retaining member, and

said end portion of said conducting wire from which said electrically-insulating layer is removed is wound onto said tie-off portion in multiple layers.